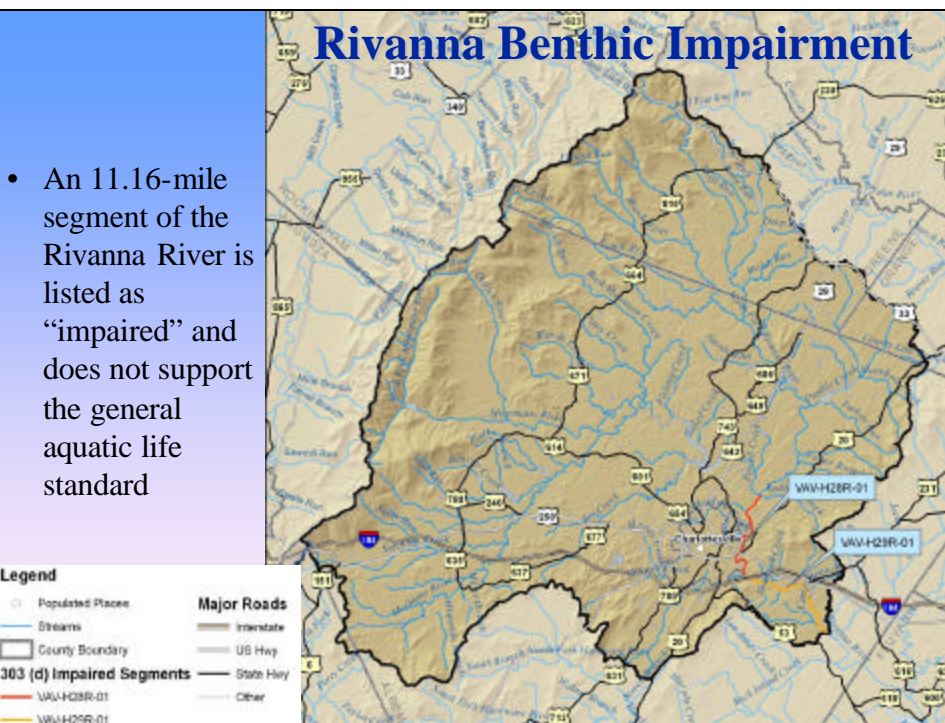




Public Meeting

Results of the Rivanna River Total Maximum Daily Load Study

February 11, 2008



Benthic Impairment

What does it mean?

- Stream does not support a healthy and diverse aquatic life

What is the standard?

- State waters shall be free from pollutants which are harmful to aquatic life

How is it assessed?

- Biologist collects and identifies benthic macroinvertebrates
- The numbers and kinds of benthic macroinvertebrates collected are compared to a healthy reference condition
- The stream is given a Stream Condition Index (SCI) score based on this comparison (<60 = impaired)

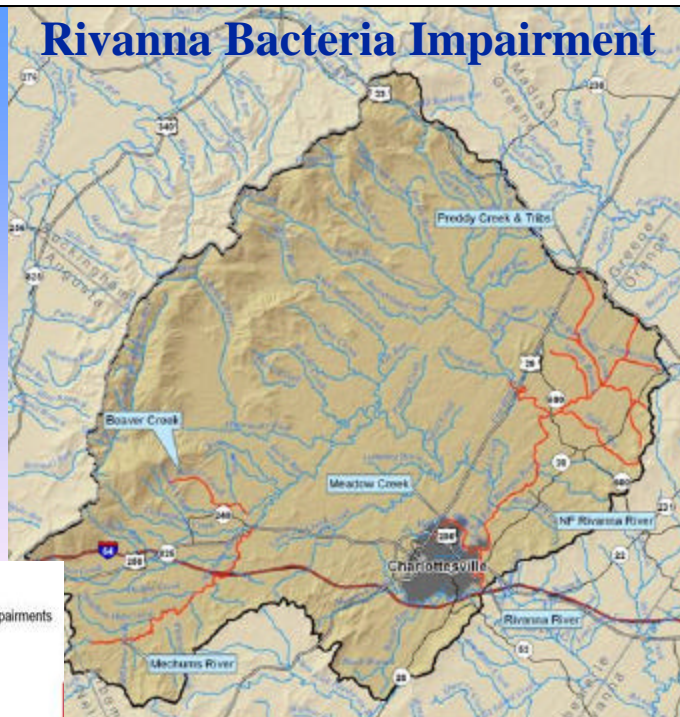


- Rivanna River (and several tributaries) are listed as “impaired” by excess bacteria from fecal waste

Rivanna Bacteria Impairment

Legend

- Interstate
- US Highway
- State Highway
- Counties
- 303d Bacteria Impairments
- Streams



Bacterial Impairment

What does it mean?

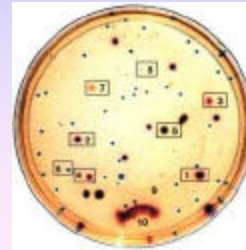
- Bacteria from human and/or animal waste exceeds the state's standard for safe swimming

What is the standard?

- No more than 235 E. coli/100ml water

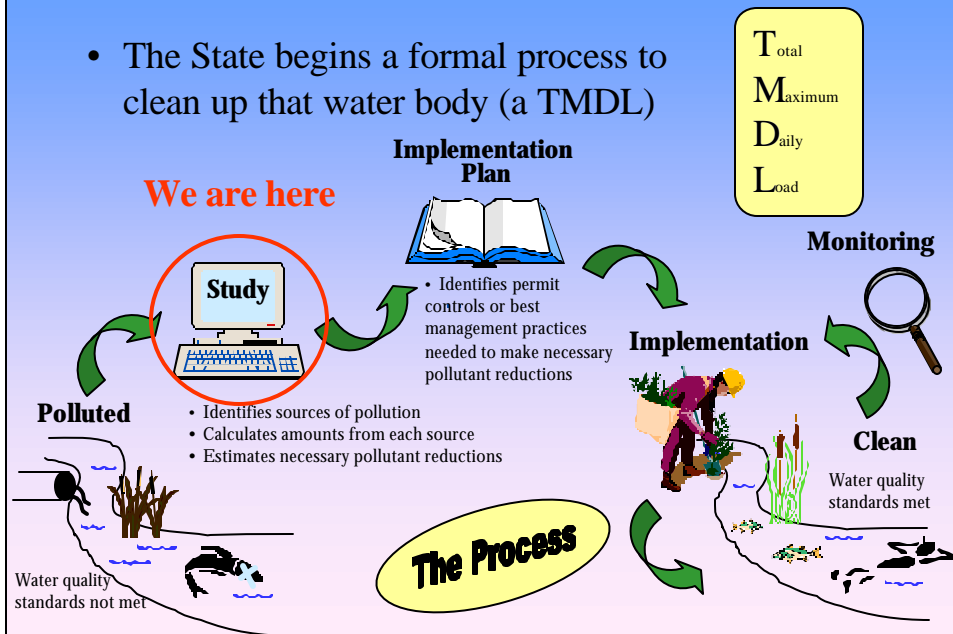
How is it assessed?

- Stream is listed as impaired if more than 10% of samples collected exceed the standard



What Happens When a Stream is Impaired?

- The State begins a formal process to clean up that water body (a TMDL)



Rivanna TMDL Studies

Aquatic Life Study

- Addressed aquatic life impairments in:
 - Rivanna River mainstem

DEQ has contracted with:



THE Louis Berger Group, INC.

to conduct the studies

Bacteria Study

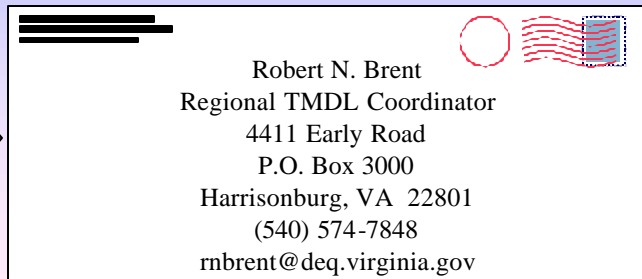
- Addressed bacteria impairments in:
 - Rivanna River mainstem
 - North Fork Rivanna
 - Preddy Creek
 - Meadow Creek
 - Mechums River
 - Beaver Creek

What is the Status of the Studies?

- Studies have been ongoing since March 07
- We have had the help of a number of local stakeholders that have served on a local steering committee
- Draft study reports are available for public review and comment from now until March 12, 2008

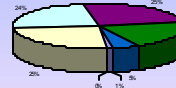
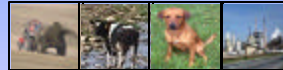
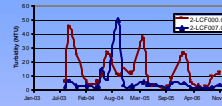
<https://www.deq.virginia.gov/TMDLDataSearch/DraftReports.aspx>

Send
comments
to:

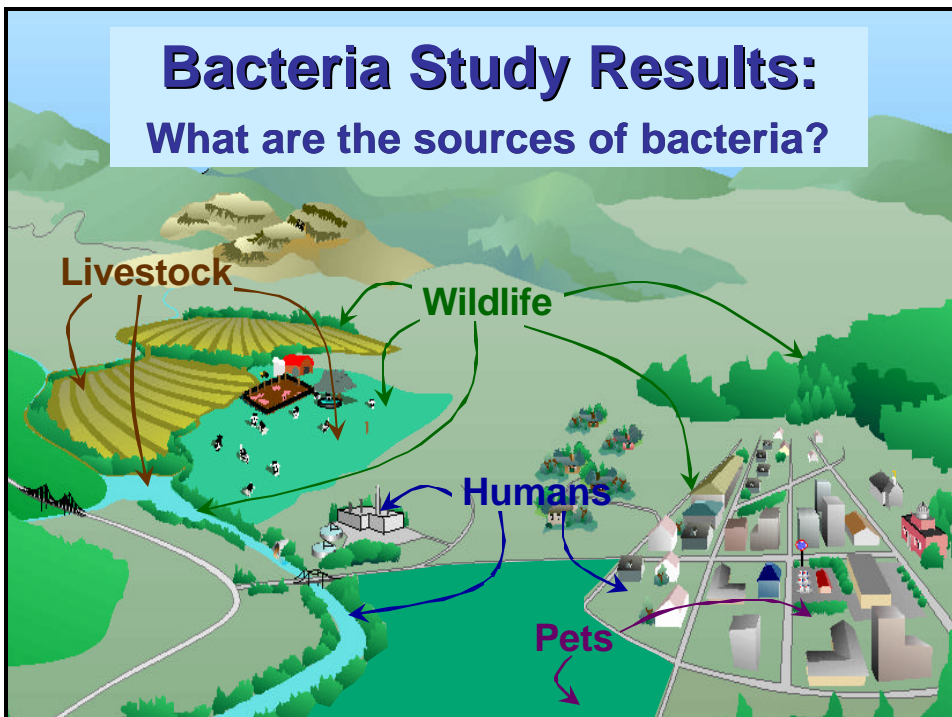


What Were the Goals of the Study?

- Identify Pollutants
- Identify Sources
- Calculate Loads
- Model Water Quality
- Estimate Reductions

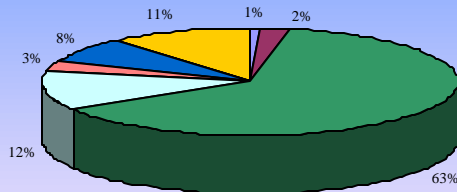


Bacteria Study Results: What are the sources of bacteria?

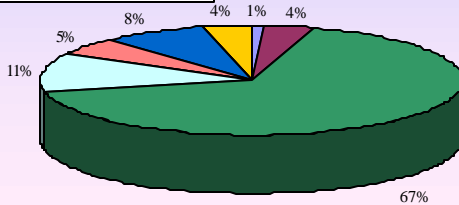


Bacteria Study Results: How much is coming from each source?

Rivanna River



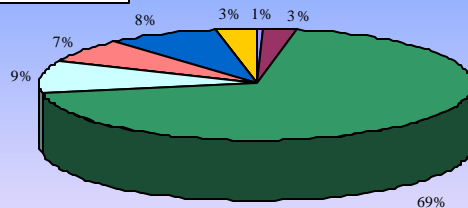
North Fork Rivanna



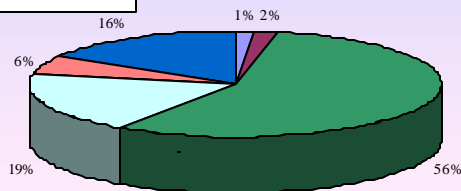
- Forest
- Cropland
- Pasture
- Urban (pets)
- Water/Wetland
- Cattle - direct deposition
- Wildlife - direct deposition
- Septics - Straight Pipes
- Point Sources
- MS4

Bacteria Study Results: How much is coming from each source?

Beaver Creek



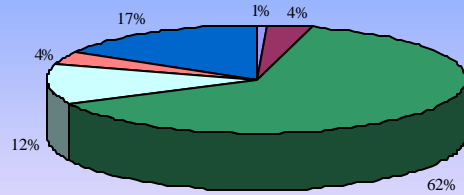
Mechums River



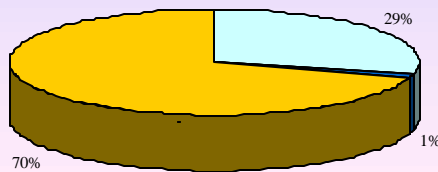
- Forest
- Cropland
- Pasture
- Urban (pets)
- Water/Wetland
- Cattle - direct deposition
- Wildlife - direct deposition
- Septics - Straight Pipes
- Point Sources
- MS4

Bacteria Study Results: How much is coming from each source?

Preddy Creek



Meadow Creek



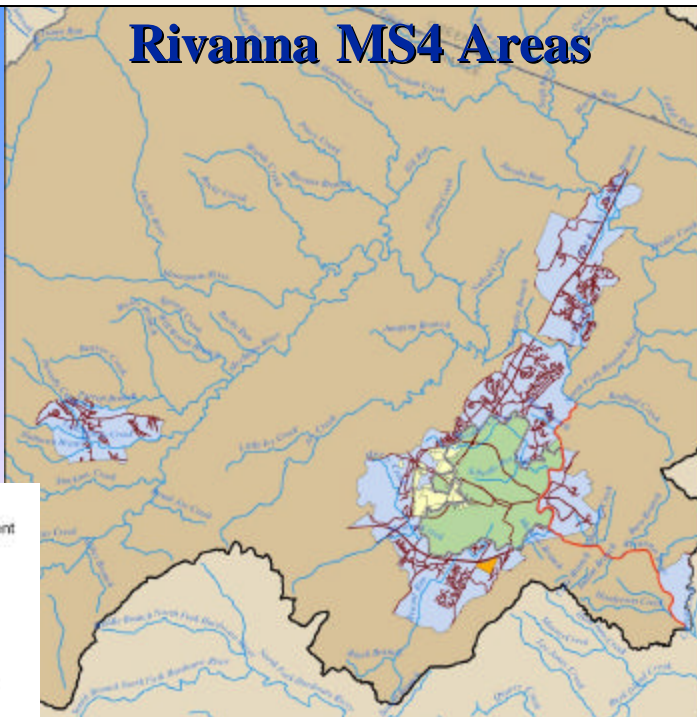
- Forest
- Cropland
- Pasture
- Urban (pets)
- Water/Wetland
- Cattle - direct deposition
- Wildlife - direct deposition
- Septics - Straight Pipes
- Point Sources
- MS4

**Municipal
Separate
Storm
Sewer
System**

Rivanna MS4 Areas

Legend

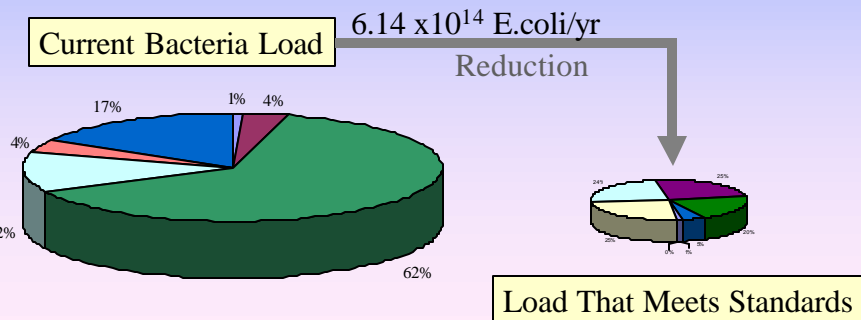
- 303d Benthic Impaired Segment
- County Boundary
- Stream
- PVCC MS4 Area
- VDOT MS4 Area
- UVA MS4 Area
- Albemarle County MS4 Area
- Charlottesville MS4 Area



Bacteria Study Results:

What reductions are needed to fix the problem?

- The report answers this question in two ways:
 - What would it take to never exceed the bacteria standard?
 - What would it take to remove the impairment (exceed the standard no more than 10% of the time)?



Necessary Reductions: to Never Exceed Bacteria Standard

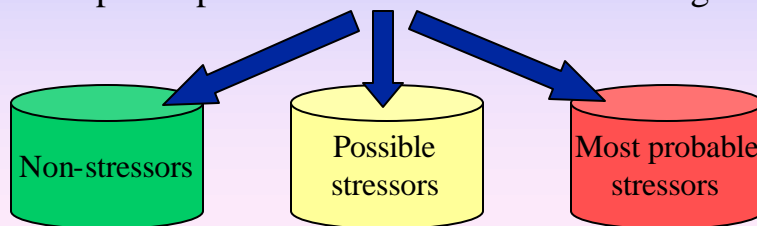
	% Reduction in Bacteria Needed				
	Straight Pipes/Failing Septics	Livestock Direct Deposit	Agricultural Runoff	Urban Runoff	Wildlife Direct Deposit
Rivanna River	100%	100%	95%	95%	76%
North Fork Rivanna	100%	100%	95%	95%	92%
Preddy Creek	100%	100%	95%	95%	72%
Meadow Creek	100%	100%	95%	95%	48%
Mechums River	100%	100%	95%	95%	76%
Beaver Creek	100%	100%	95%	95%	66%

Necessary Reductions: to Remove Bacteria Impairment

	% Reduction in Bacteria Needed				
	Straight Pipes/Failing Septics	Livestock Direct Deposit	Agricultural Runoff	Urban Runoff	Wildlife Direct Deposit
Rivanna River	100%	92%	0%	0%	0%
North Fork Rivanna	100%	100%	50%	58%	0%
Preddy Creek	100%	100%	50%	48%	0%
Meadow Creek	100%	100%	0%	23%	0%
Mechums River	100%	100%	55%	0%	0%
Beaver Creek	100%	95%	0%	0%	0%

Benthic Study Results: What Is Affecting the Bugs?

- Conducted a Stressor Identification Analysis
 - List all potential causes
 - Analyze the evidence for and against each
 - Historical and newly collected data
 - Bug community, habitat, water quality, sediment quality, etc.
 - Separate potential causes into the following bins

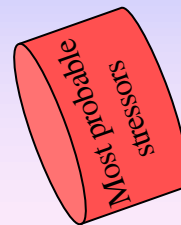


Most Probable Stressors (most likely causes)

- Sediment – physical stress caused by too much sediment smothering available habitat
 - Evidences: Relative Bed Stability Analysis, habitat assessment, macroinvertebrate data, visual assessment, sediment rating curves
- Urban Runoff – included because the largest source of sediment is from bank erosion due to increased flows; also urban runoff can carry toxics



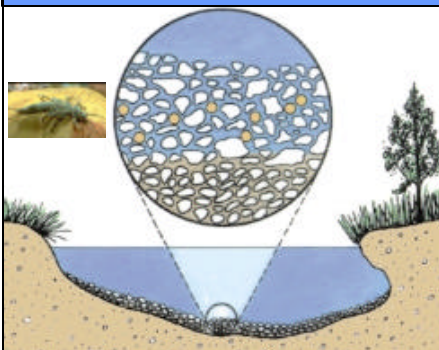
sediment
(Urban Runoff)



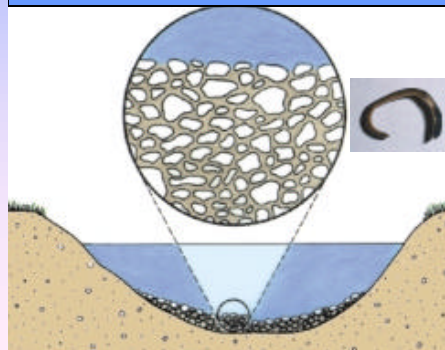
Sediment

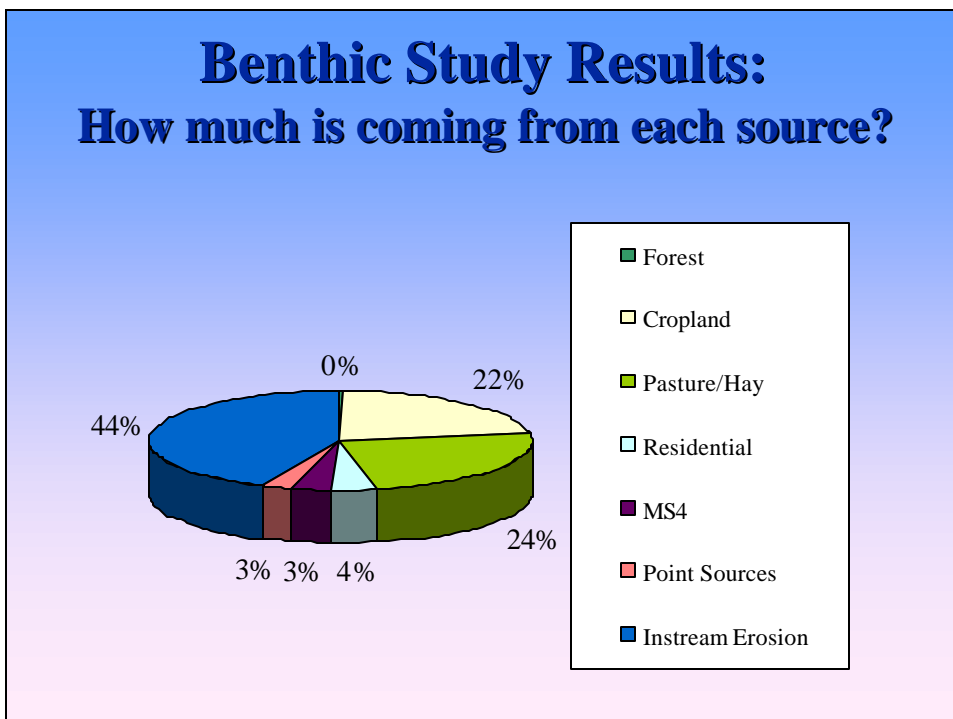
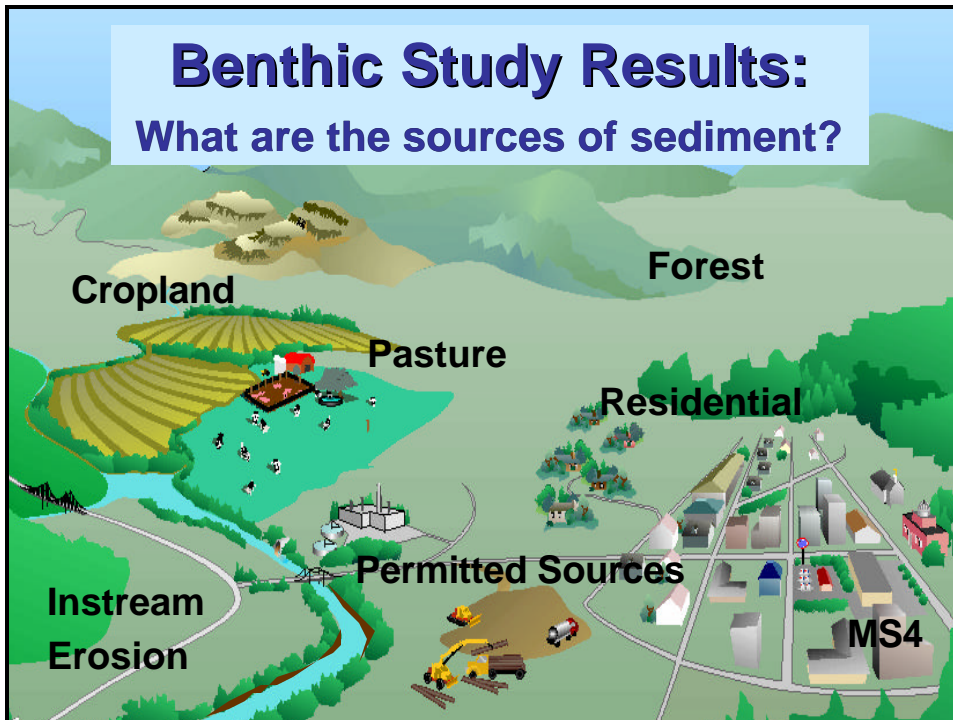
- A healthy “bug” community requires a clean stream bottom with lots of space between rocks and gravels

Healthy Stream Bottom



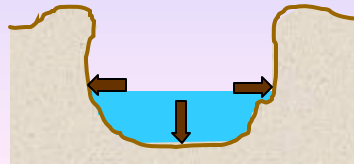
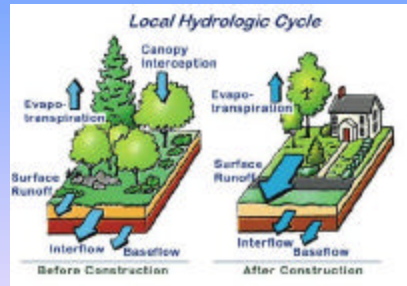
Excess Sediment



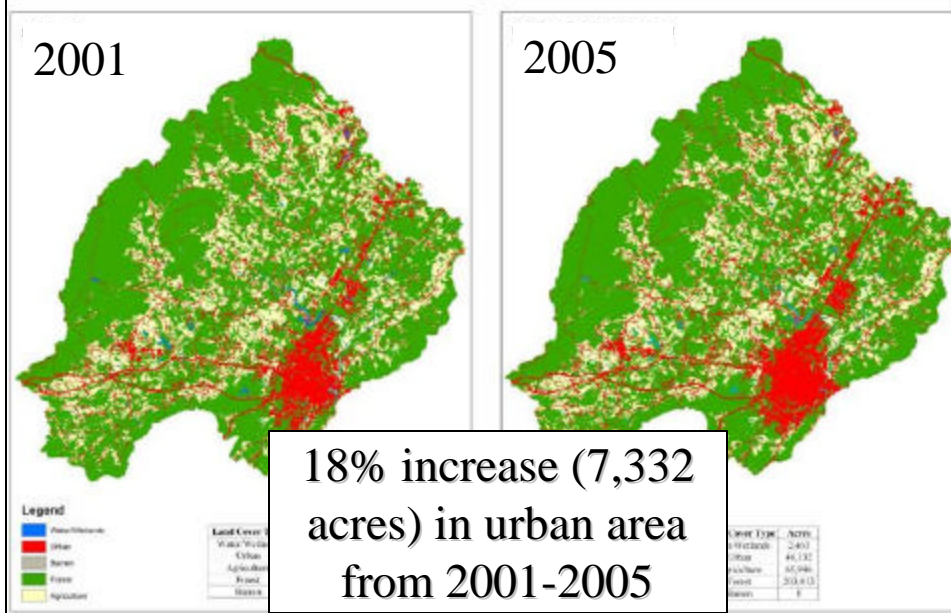


Relationship Between Impervious Area and Instream Erosion

- Impervious areas increase surface runoff
 - In Rivanna, urbanized area accounts for only 8% of land area, but 23% of runoff (~3x)
- Increased runoff increases magnitude and frequency of high stream flows
- Increased flow causes channel to adapt by widening and deepening



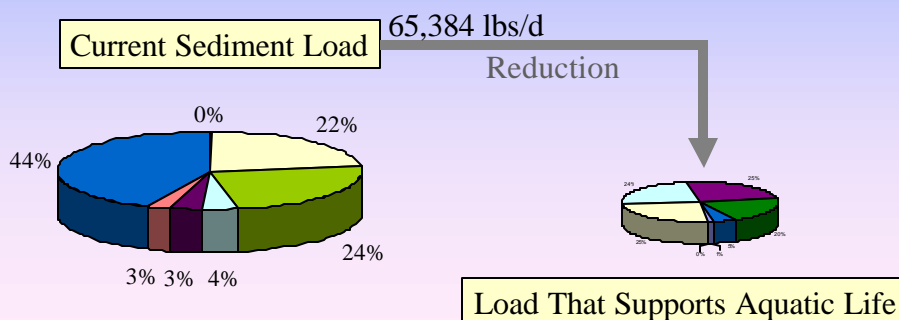
Increased Urbanization in the Rivanna



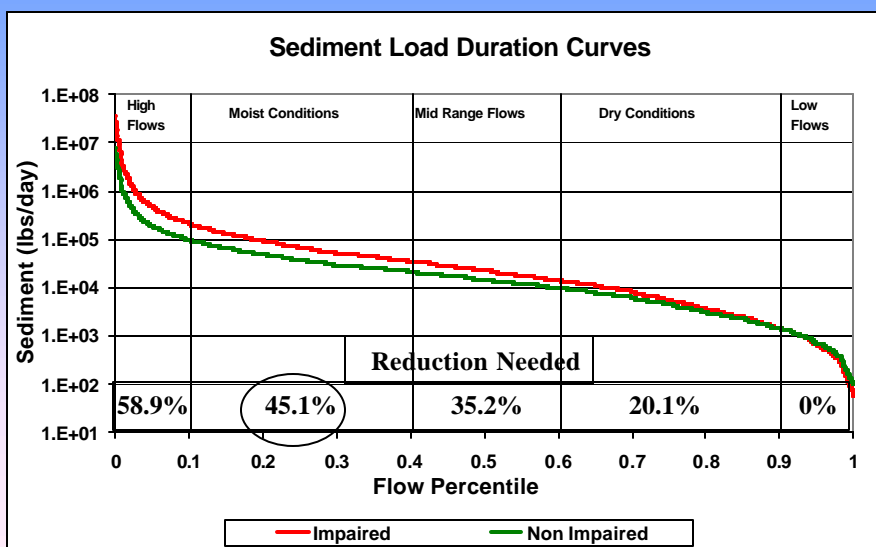
Benthic Study Results:

What reductions are needed to fix the problem?

- To figure this out, we compared the sediment loads in the Rivanna to loads in similar sized unimpaired streams
 - Used monitored flow and suspended sediment concentrations to develop sediment load duration curves



Sediment Load Duration Curves for Rivanna and Non-Impaired Streams



Necessary Sediment Reductions

Source	Land Use	Existing Load (lbs/d)	Allocated Load (lbs/d)	% Reduction
Non-Point Source	Forest	164	164	-
	Cropland	14,654	5,958	59.3%
	Pasture/hay	15,829	6,435	59.3%
	Residential	2,517	1,023	59.3%
	Instream Erosion	20,900	8,497	59.3%
MS4	Land-based	2,223	904	59.3%
	Instream Erosion	6,545	2,661	59.3%
Permitted Non-Point Sources	Land-based	1,146	1,146	-
	Instream Erosion	882	882	-
Permitted Point Sources	VPDES Permits	524	4,636	-
Margin of Safety			3,590	
Total		65,384	35,896	45.1%

What's the Next Step?

